Taxonomic notes on the genus *Stenopetalum* (Brassicaceae)

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Abstract

Keighery, G.J., Taxonomic notes on the genus *Stenopetalum* (Brassicaceae). *Nuytsia* 14(3): 393–403 (2002). The name *Stenopetalum gracile* Bunge is reinstated for part of the northern and eastern populations previously included under *S. robustum* Endl. *Stenopetalum robustum s. str.* is a decumbent white-flowered species occurring between Albany and Bunbury. A new species, *Stenopetalum salicola* Keighery, is described to cover populations previously ascribed to *S. robustum* occurring around inland salt lakes. Two coastal perennial taxa are segregated from *Stenopetalum lineare* R. Br. ex DC. *s. lat.*, with those from temperate eastern Australia reinstated as *S. lineare* var. *canescens* Benth. and the more distinctive ones from the southern Nullarbor Cliffs described as the new species *S. saxatile* Keighery. *Stenopetalum lineare* var. *lineare* comprises annual populations occurring inland. A new key is provided for the 12 species and two varieties currently recognised in *Stenopetalum*.

Introduction

The genus *Stenopetalum* R. Br. ex DC. (Brassicaceae) was revised by Shaw (1972), but as noted by Hewson (1982), many taxonomic problems remain. Members of this widespread Australian genus can be placed in a number of groups of related species and two of these species complexes are treated here. These are the *Stenopetalum robustum* complex, which has traditionally been regarded as monotypic, and the *S. lineare* species complex, which includes *S. decipiens* E. Shaw and *S. velutinum* F. Muell.

In the first complex, *Stenopetalum robustum* as treated here is restricted to populations occurring between Busselton and Albany. There are two species within the remainder of the previously broadly defined species. *Stenopetalum gracile* is reinstated to cover populations on the Swan Coastal Plain north of Busselton extending north to Kalbarri and into the western Wheatbelt. Another distinctive taxon is found around saline lakes in the interior and is here described as a new species, *S. salicola*.

The second complex includes the most widespread and variable species of the genus, *S. lineare* R. Br. ex DC. *s. lat.*, which has two distinctive perennial coastal variants. One occurring on the Nullarbor Cliffs is segregated as a new species, *S. saxatile*. The other occurring usually in near-coastal situations in Eastern Australia is reinstated as *S. lineare* var. *canescens*.

A third complex, comprising *Stenopetalum filifolium* Benth. and *S. pedicellare* F. Muell. ex Benth., is closely related to *S. robustum s. lat.* and is currently being investigated.

Taxonomy

Key to species and varieties of *Stenopetalum*

The key *to Stenopetalum* in the "Flora of Australia" (Hewson 1982: 300) can be amended as follows to include all 12 species and the two varieties currently recognised. Note that the previous key gives the first measurements of couplet 12 as fruiting pedicels, however, there is considerable elongation in the pedicel between flowering and fruiting and the two species overlap in fruit.

1. Plant with branched hairs
  2. Hairs sessile, bifid ..... **S. nutans**
  2: Hairs irregularly branched or stellate
    3. All parts of plant densely hairy
      4. Plants slender annuals; silicula 4–7 mm long; ovules 10–20 per locule; seeds tuberculate ..... **S. velutinum**
      4: Plants perennial with a corky rootstock, silicula 7–11 mm long; ovules 3–10 per locule; seeds smooth ..... **S. decipiens**
    3: Upper parts of plant glabrous to sparsely hairy
      5. Plants slender annuals; leaves of lower stem pinnatisect to trisect ..... **S. lineare** var. **lineare**
      5: Plants slender perennials, rootstock not corky; leaves entire, remotely dentate or rarely trisect
        6. Upper parts of plant glabrous ..... **S. lineare** var. **canescens**
        6: Upper parts of plant sparsely hairy, chiefly at nodes ..... **S. saxatile**
1: Plant glabrous, or with papillae or simple hairs
  7. Fruiting pedicels erect to spreading
    8. Leaves entire to dentate; ovules 6–10 per locule ..... **S. filifolium**
    8: Leaves pinnasect basally, reducing to entire; ovules 8–15 per locule ..... **S. anfractum**
  7: Fruiting pedicels pendulous, rarely horizontal
    9. Plants covered in simple hairs, petals short and broad ..... **S. robustum**
    9: Plants glabrous, petals fine and tapering
      10. Fruiting pedicel swollen adjacent to fruit ..... **S. salicola**
      10: Fruiting pedicel not swollen adjacent to fruit
        11. Petals 3–6 mm long, often cleistogamous ..... **S. sphaerocarpum**
        11: Petals 6–25 mm long
          12. Flowering pedicels robust, 2–3 mm long, silicula 5–9 mm long, seeds *c.* 2 mm long ..... **S. gracile**
          12: Flowering pedicels slender, 7–20 mm long, silicula 4–5 mm long, seeds *c.* 1 mm long ..... **S. pedicellare**

A. The *Stenopetalum robustum* species complex

True *Stenopetalum robustum* is a decumbent, shortly hairy, annual herb, bearing pure white flowers, which have a sickly sweet fetid odour typical of many fly-pollinated flowers (e.g. *Laxmannia* in the Anthericaceae). The corolla lobes are very short and broad (*c.* 2 mm wide and up to 6 mm long, a ratio of 3 or less), compared to other members of this complex (1–2 mm wide and up to 10 mm long, a ratio of 4–8). The key characters separating this species from other members of the genus are the presence

of short hairs on the stem, inflorescence axis and peduncle, and the white flowers with short broad corolla lobes.

Stenopetalum gracile Bunge, A.A. von *in* Lehmann, Pl. Preiss. 1: 257 (Feb. 1845). – *Stenopetalum robustum* var. *gracile* (Bunge) Ostenf., *Kongl. Danske Vidensk. Selsk. Biol. Med.* 3(2): 65 (1921). *Type:* "In arenosis umbrosis vallis haud longae ab ora maritima Perth" [near Perth, Western Australia], 24 June 1839, *L. Preiss* 1938 (*iso:* W!, MEL!).

Stenopetalum croceum Bunge, A.A. von *in* Lehmann, Pl. Preiss. 1: 258 (Feb. 1845). *Type:* "In arenosis sylvae haud longae ab oppidulo Perth" [near Perth, Western Australia], 13 December 1838, *L. Preiss* 1939 (*iso:* W!, MEL!).

Erect annual *herb* up to 20 cm, normally less, generally glabrous but some plants have a few scattered simple hairs on the basal 10 mm of the stem, with the inflorescence axis glabrous, hairs lost on all plants as the fruits mature. *Basal leaves* once divided, 20–40 mm long, *c.* 2 mm wide, glabrous or with a few scattered simple hairs, lobes 4–8 mm long, usually lost after flowering finishes. *Stem leaves* pinnatifid, 2–15 mm long. *Floral leaves* often linear, entire, 5–8 mm long. *Flowers* usually slightly decurved or at right angles to stem at anthesis, sweetly scented. *Pedicels* up to 3 mm long in flower, prominently decurved (45° to stem) and 7–10 mm long in fruit, glabrous. *Sepals c.* 3 mm long, white to pale orange. *Petals* 15–25 mm long, less than 1 mm wide, white or orange-brown. *Capsule* obovoid, *c.* 4 mm long. (Figure 1A–C)

Selected specimens examined. WESTERN AUSTRALIA (43 seen): Moora, Sep. 1946, *A.M. Ashby* 159 (PERTH); Valentine Rd, S of Yuna, 30 Aug. 1967, *A.M. Ashby* 2276 (PERTH, AD); 6 miles [10 km] WNW of Murchison House Station Homestead, 28 Aug. 1969, *A.S. George* 9612 (PERTH); Lake Clifton, 17 Oct. 1992, *G.J. Keighery* 13804 (PERTH); Claremont, 10 Nov. 1900, *A. Morrison s.n.* (PERTH).

Distribution. The species occurs between Capel and Toolonga inland to Yuna and Moora. (Figure 2A)

Habitat. Usually on calcareous sandy soils and limestone ridges near the coast but also recorded from white, yellow and red sands further inland. Grows under coastal heath, limestone shrublands, Tuart (*Eucalyptus gomphocephala*) and *Banksia* woodlands.

Flowering period. Late August to early November.

Conservation status. Widespread and well conserved.

Notes. This species was named twice, as *Stenopetalum gracile* Bunge and *S. croceum* Bunge, on successive pages of "Plantae Preissianae", from specimens collected near Perth. The name appearing first, *S. gracile*, is here selected.

Stenopetalum gracile is an erect annual herb that is generally glabrous, although some plants have a few scattered simple hairs on the basal 10 mm of the stem. Its basal leaves are once divided and its pale orange or white flowers have a sweet honey scent and very long narrow petals. The species is found naturally in openings in the coastal communities of the Swan Coastal plain and does not appear to be dependent on fire to occur in large numbers.

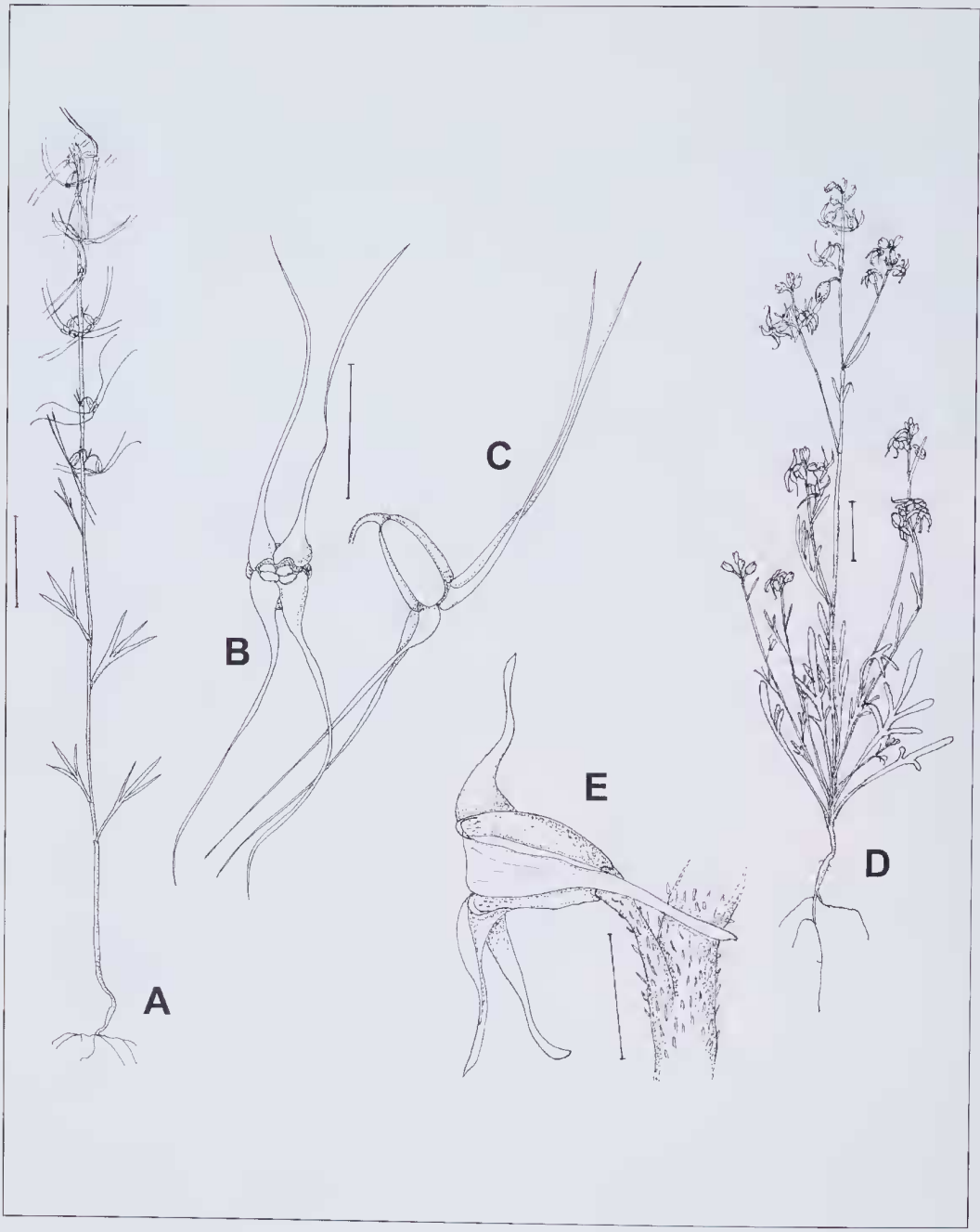


Figure 1. A–C. *Stenopetalum gracile*. A – whole plant, scale bar = 20 mm; B,C – front and side views of flower, scale bar = 10 mm. D,E. *Stenopetalum robustum*. D – whole plant, scale bar = 20 mm; E – flower, scale bar = 5 mm. Drawn from PERTH specimens *G.J. Keighery* 13804 (A–C) and *G.J. Keighery* 9789 (D,E).

There are two anomalous PERTH collections from inland Western Australia (Wanjarri Nature Reserve, 4 Aug. 1988, *G.J. Keighery s.n.*; 30 km N of Mt Beaumont, *M.A. Burgman & C. Layman* 3102) that key to *Stenopetalum gracile*. These are indicated by stars on Figure 2A. These collections may be better placed in *S. salicola* (in part) or in the closely related species complex involving *S. filifolium*. The *S. filifolium* complex will be the subject of a separate study.

Stenopetalum robustum Endl., Enum. Pl. 4 (1837). *Type:* King George Sound, Western Australia, *Hügel* (*holo:* W!).

Stenopetalum minus Bunge, Pl. Preiss. 1: 258 (1845). *Type:* Princess Royal Harbour, Western Australia, December 1840, *L. Preiss* 1936 (*iso:* MEL!).

Stenopetalum brachypetalum F. Muell. and *Stenopetalum robustum* var. *brachypetalum* F. Muell. *nom. alt.*, Fragm. 11: 60 (1879). *Type:* "legi in vicinia sinus regis Georgii" [vicinity of King George Sound, Western Australia] (*iso:* MEL!).

Stenopetalum album E. Pritz., *Repert. Spec. Nov. Regni. Veg.* 10: 133 (1911). *Type:* "In partibus australibus prope oppidulum Busselton haud procul ab ora marina" [near Busselton], Western Australia, October 1909, *M. Koch* 1969 (*iso:* MEL!, PERTH!).

A decumbent or rarely erect *herb*, up to 20 cm tall and 30 cm wide but normally much less, with scattered to dense simple hairs on all vegetative parts. *Basal leaves* usually divided, up to 70 x 5 mm. *Inflorescence axis* covered with short simple appressed hairs. *Floral leaves* usually simple, linear to linear-obovate, 5–25 mm long, apex acute, with scattered short simple appressed hairs. *Flowers* usually slightly decurved or at right angles to stem at anthesis, with a sweet fetid scent. *Pedicels* up to 3 mm long in flower, prominently decurved (45° to stem) and 4–6 mm long in fruit, with short appressed hairs that are scattered at base and becoming denser at summit. *Sepals* up to 3 mm long, greenish white. *Petals* up to 6 mm long, *c.* 2 mm wide, white. *Fruit* obovoid, 3–4 mm long, *c.* 3 mm wide. (Figure 1D,E)

Selected specimens examined. WESTERN AUSTRALIA (31 seen): Lake William, West Cape Howe National Park, 9 Nov. 1987, *G.J. Keighery* 9789 (PERTH); 3.5 miles [6 km] down track to Boat Harbour, W of Denmark, 10 Sep. 1971, *K.F. Kenneally* 71/72 (PERTH); Nornalup Inlet, 12 Oct.1968, *R.D. Royce* 8486 (PERTH); intersection of Hooley Rd and Georgette Rd, Leeuwin–Naturaliste National Park, 28 Nov. 1989, *N. Gibson & M. Lyons* 422 (PERTH); Symmonds Block, Tuart Forest, W of Ludlow, 12 Sep. 1994, *G.J. Keighery* 13579 (PERTH).

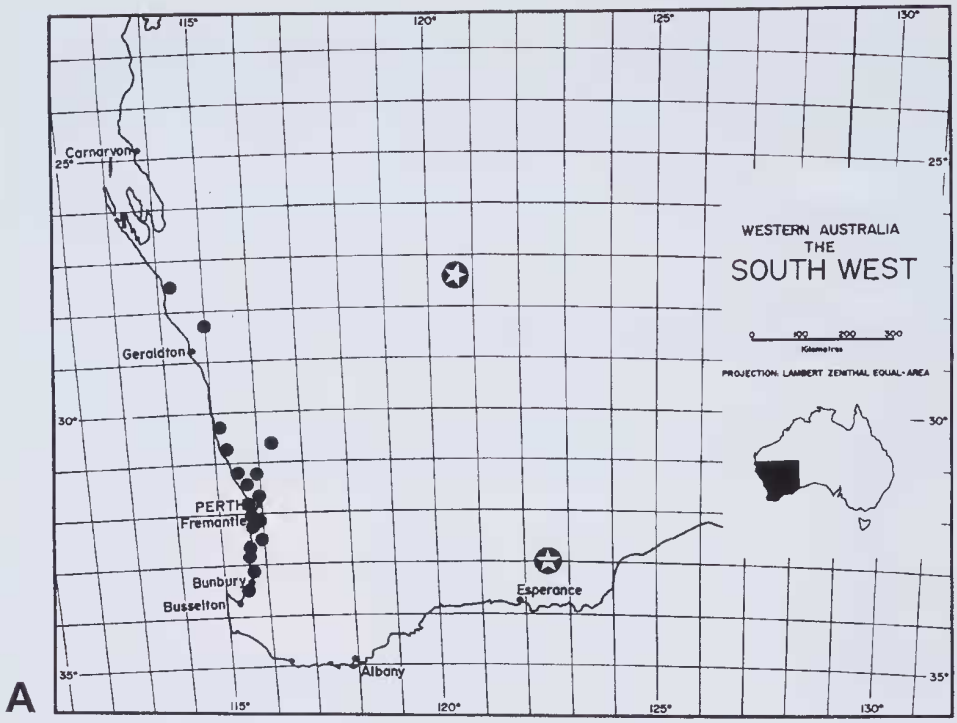
Distribution. Coastal sites between Busselton and Albany. (Figure 2B)

Habitat. On sandy soils under coastal shrublands and woodlands. The species behaves as a post fire ephemeral occurring in very large populations in many conservation reserves after fire.

Flowering period. September to October.

Conservation status. Widespread and well conserved. Recorded for most major national parks (Torndirrup, West Cape Howe, William Bay, Walpole–Nornalup, Scott, Leeuwin–Naturaliste) along the southern coast and from the Tuart National Park on the Swan Coastal Plain.

Notes. See notes under part A. The *Stenopetalum robustum* species complex.



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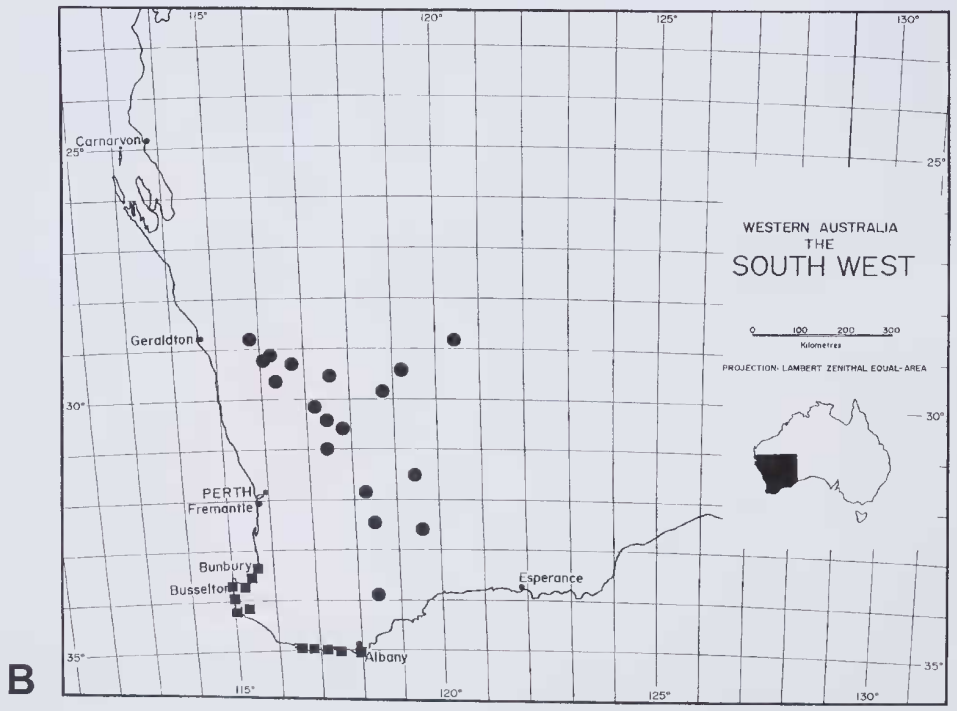

B

Figure 2. Distribution maps. A – *Stenopetalum gracile* ● and atypical populations ✪; B – *Stenopetalum robustum* ■ and *S. salicola* ●.

Stenopetalum salicola Keighery, *sp. nov.*

Species haec ab *Stenopetalum gracile* Bunge, differt fructiferii pedicellis tumidulus supra basin.

Typus: 33.4 km S of Perenjori on road to Wubin, Western Australia, 27 July 1996, *B.J. Lepschi* 2724 & *T.R. Lally* (*holo:* PERTH 04585232).

Erect annual *herb*, up to 20 cm but normally less, generally glabrous but some plants with a few scattered simple hairs on the basal 10 mm of the stem, with the inflorescence axis glabrous, the hairs lost on all plants as the fruits mature. *Basal leaves* once divided, 20–40 mm long, *c.* 2 mm wide, glabrous, lobes 4–8 mm long, usually lost after flowering finishes. *Stem leaves* pinnatifid, 2–15 mm long. *Floral leaves* often linear, entire, 5–8 mm long. *Flowers* usually slightly decurved or at right angles to stem at anthesis, sweetly scented. *Pedicels* 4–5 mm long in flower, becoming swollen adjacent to the fruit and prominently decurved, 7–10 mm long in fruit, glabrous. *Sepals* 2–3 mm long, white to pale orange. *Petals* orange-brown, 15–25 mm long, less than 1 mm wide. *Capsule* obovoid, *c.* 4 mm long. (Figure 3A–C)

Selected specimens examined. WESTERN AUSTRALIA (23 seen): 3 km SE of Morawa, 10 Aug. 1973, *A. Kanis* 1625 (PERTH); Cowcowing, *M. Koch* 1072 (PERTH); Lake Harvey, 14 Aug. 1999, *M.N. Lyons* 2621 (PERTH); Lake Raeside, 1 Sep. 1968, *P.G. Wilson* 7556 (PERTH).

Distribution. Recorded from the edges of most saline (usually gypsum rich) lakes and braided drainage lines in the Avon wheatbelt region. (Figure 2B)

Habitat. Recorded from low dunes, claypans and dune slopes in *Halosarcia* shrubland, *Eucalyptus spathulata* mallee and *Melaleuca* shrubland (M.N. Lyons, pers. comm.).

Flowering period. July to September. Fruits are recorded from September to November.

Conservation status. Widespread and well conserved, but under long term threat by rising saline ground-waters and locally by gypsum mining.

Notes. This taxon is probably the cause of the confusion previous authors (e.g. Shaw 1972; Hewson 1982) have noted in separating *Stenoptalum robustum* and *S. filifolium*. It is readily distinguished from both by its swollen pedicel when in fruit. As previously noted the latter species will be the subject of a separate study.

Being a small slender annual, *Stenopetalum salicola* is also superficially similar to *S. sphaerocarpum* F. Muell., an inbreeding and often cleistogamous herb that occurs around saline lakes in the arid zone of Western Australia. The latter species is readily distinguished by its smaller flowers with slender petals 3–6 mm long, and its spreading or erect globose fruits.

B. The *Stenopetalum lineare* complex

The *Stenopetalum lineare* species complex is widespread and variable, comprising four closely related species, including both annual and perennial outbreeding taxa as well as one inbreeding, often cleistogamous, taxon. The inbreeding taxon is a common variant of *S. lineare* (illustrated in Keighery *et al.* 1986) that is found throughout the range of the species.

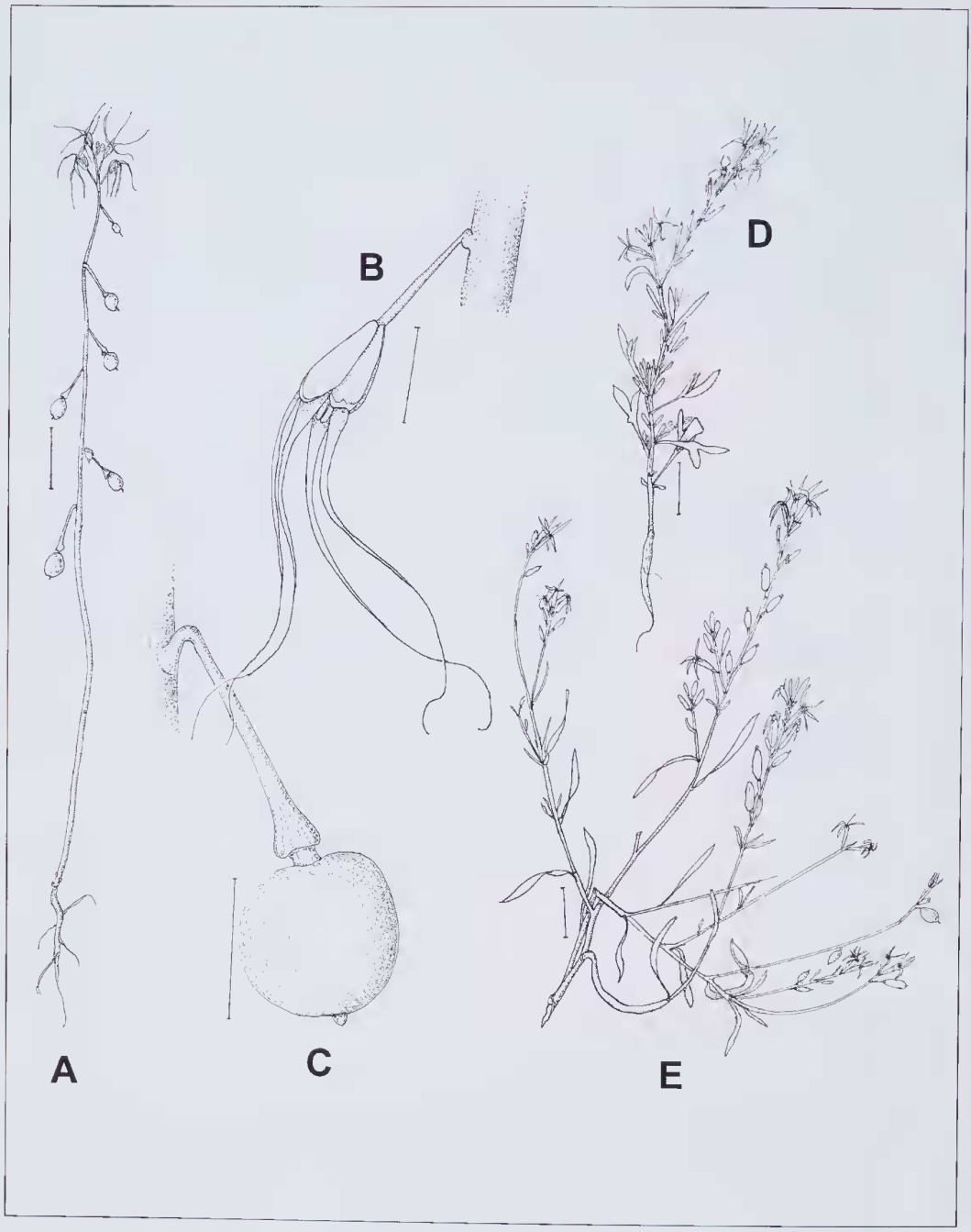

Figure 3. A–C. *Stenopetalum salicola*. A – whole plant, scale bar = 10 mm; B – flower, scale bar = 2 mm; C – fruit, scale bar = 4 mm. D,E. *Stenopetalum saxatile*. D – young plant, scale bar = 20 mm; E – flowering branch, scale bar = 20 mm. Drawn from PERTH specimens *M. Lyons* 2621 (A–C) and *G.J. Keighery & J. Alford* 920 (D,E).

During a survey of the flora of the Nullarbor region (Keighery *et al.* 1986), a distinctive new member of the widespread *Stenopetalum lineare* complex was located along the Nullarbor Cliffs. This was a shrubby perennial with sweetly scented open flowers, which is described below as *S. saxatile*. The adjacent Nullarbor variant of *S. lineare* is annual, and most specimens have insignificant flowers that are only partially opened or are cleistogamous. The new perennial taxon, which is confined to coastal cliffs, is the only member of the *S. lineare* complex present through most of its range. However, the two species co-occur in the Eucla area and, although they are not known to co-occur elsewhere, they do overlap in distribution near Eyre. The only known location where the annual *S. lineare* (*G.J. Keighery & J. Alford* 1431) and perennial *S. saxatile* (*G.J. Keighery & J. Alford* 920) occur together is in Eucla National Park, 1 km west of the State border. In both the Eucla and Eyre areas, there is no sign of any overlap in characters or evidence of hybridisation between the two species.

Black (1963), in his discussion of *Stenopetalum lineare*, had also recognised that an undescribed species of *Stenopetalum* was present in the Tate Herbarium represented by a collection from Fowlers Bay. This taxon corresponds to the new species discussed above.

Black also recognised var. *canescens* as distinct, but misapplied this name to the then undescribed *S. decipiens*. *Stenopetalum lineare* var. *canescens* applies to a glabrous perennial variant of the complex found chiefly in coastal sites in south-eastern Australia. This variant is reinstated below.

Stenopetalum lineare var. **canescens** Benth., Fl. Austral. 1: 78 (1863). *Type:* Port Phillip, Victoria, *F. Mueller* (*holo:* K; *iso:* MEL 10745).

Slender spreading *shrub*, with several soft-wooded stems arising from a woody rootstock, to 20 cm tall and 2 m wide, normally much less. *Stems* green aging brown, glabrous. *Leaves* linear-spathulate to obovate, tapering to a slender petiole 3–10 mm long; lamina 50–100 mm long, generally entire but occasionally with short lobes, glabrous, succulent. *Floral leaves* usually simple, linear to linear-obovate, 5–25 mm long, apex acute. *Pedicels* erect and *c.* 2 mm long in fruit. *Sepals* strongly saccate and enclosing ovary, 3–4 mm long, green to colourless; upper portion (above saccate base) *c.* 1 mm long, acute, with a scarious margin. *Petals* spreading, linear, 10–13 mm long, *c.* 2 mm wide, orange-brown. *Fruit* obovoid, 5–8 mm long.

Other specimens examined. SOUTH AUSTRALIA: Dark Island Soak, Keith, Oct.1954, *R.L.Specht s.n.* (AD 9651431).
VICTORIA: mouth of Darby River, Wilsons Promontory, 7 Nov. 1908, *Audas & St John s.n.* (MEL); mouth of Aire River, 7 Oct. 1979, *G.W. Carr* 7783 (MEL); near Brighton, Nov. 1852, *F. Mueller* (MEL 10753 & 10780, labelled as *S. gratulatorium* in Mueller's handwriting); Wilsons Promontory, *s. d., s. coll.* (MEL 10735, labelled as *S. gratulatorium* in Mueller's handwriting); Wilsons Promontory, 12 May 1853, ?*F. Mueller* (MEL 10733, labelled as *S. lineare* var *latifolium* in Mueller's handwriting).

Distribution and habitat. Collections that are referable to this variety are known from coastal sand dunes in Victoria and from the Dark Island Heath in South Australia. The taxon ranges from Keith in South Australia to Wilsons Promontory in Victoria.

Flowering period. October to November.

Conservation status. The taxon is poorly collected. The most recent collections seen are over 20 years old but var. *canesens* is probably widespread in South Australia and southern Victoria.

Notes. Specimens of this taxon at MEL have been variously labelled by Mueller as *Stenopetalum gratulatorium* F. Muell. ms. or *S. lineare* var. *latifolium* F. Muell. ms. The taxon was formally named by Bentham (1863) in "Flora Australiense" as *Stenopetalum lineare* var. *canescens*.

This variety is restricted to mainly coastal areas in south-eastern Australia, occurring on sands not limestone, and resprouting after fires, with individual plants occupying an area 1–2 m wide (AD 9651431).

The author has not been able to study populations of this taxon in the field. These populations may prove to be better placed under *S. saxatile*, to which they key. The eastern taxon differs from *S. saxatile* in being completely glabrous, with entire often succulent leaves and slender fruits. There is also a considerable disjunction in the ranges of these two taxa and they have very different habitats. Until further studies can be undertaken, it seems best to retain the coastal eastern taxon in *S. lineare* and and reinstate it as variety *canescens*.

This taxon is poorly represented in herbaria, the most recent collection sighted dating from 1979. Further collections of coastal *Stenopetalum* populations are needed from South Australia and Victoria.

Stenopetalum saxatile Keighery, *sp. nov.*

Fruticulus gracilis erectus ad 50 cm altus vel raro decumbens, caudex lignosus. Folia simplicia raro trilobus, linearis-sphathulatus ad obovatus. Petala croceus-fuscus, lineare, 4–5 mm longa.

Typus: 10 km north of Eyre (32°10'S, 126°18'E), Western Australia, 1 October 1984, *G.J. Keighery* 7556 (*holo:* PERTH 03289907; *iso:* CANB).

Slender erect or rarely decumbent *shrub*, with several short-lived soft-wooded stems arising from a woody rootstock, up to 50 cm tall; young shoots and plants often covered with white branched hairs, which become scattered on the leaves. *Stems* green aging brown, becoming sparsely hairy chiefly around the nodes. *Leaves* linear-spathulate to obovate tapering to a slender petiole 3–10 mm long; lamina 5–15 mm long, generally entire but occasionally trifid, sparsely hairy. *Pedicels* erect and *c.* 2 mm long in fruit. *Sepals* strongly saccate and enclosing ovary, 3–4 mm long, green to colourless; upper portion (above saccate base) *c.* 1 mm long, acute, with a scarious margin. *Petals* spreading, linear, 4–5 mm long, *c.* 1 mm wide, orange-brown. *Fruit* obovoid, 4–6 mm long. (Figure 3D,E)

Selected specimens examined. WESTERN AUSTRALIA and SOUTH AUSTRALIA: 20 km E of Eucla, 3 Sep.1981, *R. Bates* 986 (AD); Eucla, *H.H. Carey s.n.* (MEL); 9 km WSW of Eucla,15 Sep.1971, *H.J.Eichler* 21325 (AD); Eucla National Park, on the border between Western Australia and South Australia, 13 Oct. 1986, *G.J. Keighery & J. Alford* 920 (PERTH); Wilsons Bluff, 3 km E of Eucla, 12 Oct. 1986, *G.J. Keighery & J. Alford* 1078 (PERTH); 3 km E of Eucla, 16 Oct. 1986, *G.J. Keighery & J. Alford* 1567 (PERTH); Fowlers Bay, summer 1879, *Mrs Richards* (AD 96115075 & 96115078); Eucla, 1896, *C. Ryan s.n.* (MEL 11006); towards Spencers Gulf, *Maj. Warburton* (MEL); Madura, 5 Sep. 1963, *J.H. Willis s.n.* (PERTH, MEL); 3 km N of old Eucla, *P.G. Wilson* 1647 (AD).

Distribution and habitat. Occurs on the Nullarbor Cliffs in near coastal sites between Eyre in Western Australia and Fowlers Bay in South Australia.

Flowering period. August to October.

Conservation status. The western populations are in Nuytsland Nature Reserve and Eucla National Park. The species is not considered as endangered.

Notes. This species is one of three perennial members of the *S. lineare* complex. Plants of *Stenopetalum saxatile* are finer in all aspects of morphology than one of these taxa, *S. lineare* var. *canescens*, which is described above. The other perennial member of the group is *S. decipiens*, which occurs on the inland ranges of Western Australia, Northern Territory and Queensland. It differs from *S. saxatile* in having an enlarged corky stem base, densely hairy stems and leaves, larger ovate-oblong fruits and larger seeds.

Acknowledgements

Type collections were borrowed from W. The author was able to view type material, and other collections at SYD, MEL and AD with the assistance of these organisations, and an ABRS grant. Thanks are also due to the other bodies who funded the many biological surveys noted herein, and especially to my co-workers who made these expeditions productive and enjoyable.

Michael Lyons provided access to his records and numerous collections of *Stenopetalum salicola* gathered during the Salinity Action Plan Survey.

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